

Name: _____

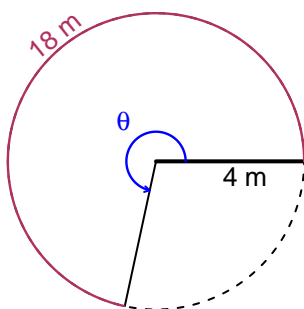
Date: _____

Trig Final (SLTN v620)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 4 meters. The arc length is 18 meters. What is the angle measure in radians?

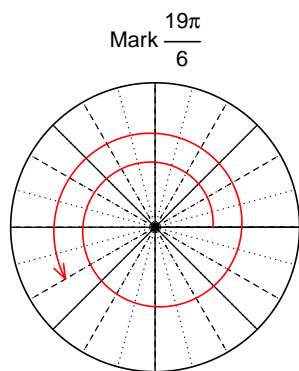


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$\theta = 4.5$ radians.

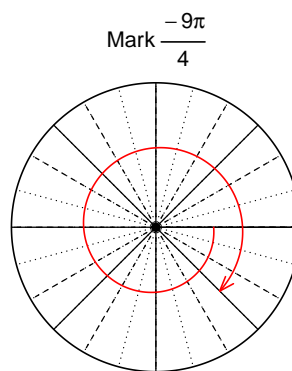
Question 2

Consider angles $\frac{19\pi}{6}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{19\pi}{6}\right)$ and $\sin\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(19\pi/6)$

$$\cos(19\pi/6) = \frac{-\sqrt{3}}{2}$$



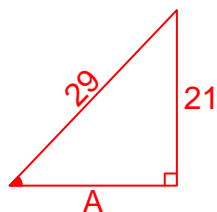
Find $\sin(-9\pi/4)$

$$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$$

Question 3

If $\sin(\theta) = \frac{-21}{29}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

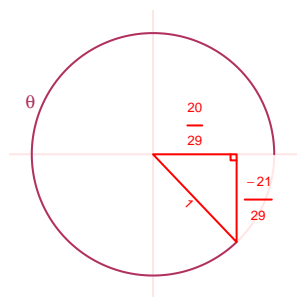
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}A^2 + 21^2 &= 29^2 \\A &= \sqrt{29^2 - 21^2} \\A &= 20\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{20}{29}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 4.31 meters, a frequency of 8.24 Hz, and a midline at $y = -2.71$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.31 \cos(2\pi 8.24t) - 2.71$$

or

$$y = -4.31 \cos(16.48\pi t) - 2.71$$

or

$$y = -4.31 \cos(51.77t) - 2.71$$